

# Charles Dunbar Koven

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## CONTACT INFORMATION

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## RESEARCH INTERESTS

I study global climate change and the feedbacks between terrestrial ecosystems and the Earth system. My research focus is on high-latitude feedbacks to climate change, in particular the dynamics of soil carbon in permafrost soils.

## EDUCATION

University of California, Berkeley, CA  
Ph.D., Environmental Science, Policy, and Management, December 2006  
· Dissertation: *On the sources, composition, and climatic effects of mineral dust in the atmosphere*  
· Advisor: Inez Fung

Yale University, New Haven, CT  
B.S., Geology, May 1998

## HONORS AND AWARDS

NASA: Earth System Science Fellowship 2004-2006  
Yale University: Penfield prize for mineralogy, May 1998

## PUBLICATIONS

- Koven, C., W. Riley, M. Torn, Z. Subin, J. Tang, W. Collins, D. Lawrence, G. Bonan, S. Swenson. (2013, accepted) The effect of vertically-resolved soil biogeochemistry and alternate soil C and N models on C dynamics of CLM4. *Biogeosciences Discuss.*, 10, 7201-7256, doi:10.5194/bgd-10-7201-2013
- Oleson KW, Lawrence DM, Bonan GB, Drewniak B, Huang M, Koven CD, Levis S, Li F, Riley WJ, Subin ZM, Swenson SC, Thornton PE, Bozbiyik A, Fisher R, Heald CL, Kluzek E, Lamarque J, Lawrence PJ, Leung LR, Lipscomb W, Muszala S, Ricciuto DM, Sacks W, Tang J, Yang Z. (2013) Technical Description of version 4.5 of the Community Land Model (CLM). NCAR Technical Note NCAR/TN-503+STR.
- Koven, C. Boreal carbon loss due to poleward shift in low-carbon ecosystems. *Nature Geoscience*, 6, 452-456. doi:10.1038/ngeo1801
- Kuhry P, Grosse G, Harden JW, Hugelius G, Koven CD, Ping C, Schirrmeyer L, Tarnocai C. (2013) Characterisation of the Permafrost Carbon Pool. *Permafrost and Periglacial Processes*, 24(2):146-155. doi:10.1002/ppp.1782
- Mishra U, Jastrow JD, Matamala R, Hugelius G, Koven CD, Harden JW, Ping CL, Michaelson GJ, Fan Z, Miller RM, McGuire AD, Tarnocai C, Kuhry P, Riley WJ, Schaefer K, Schuur EAG, Jorgenson MT, Hinzman LD. (2013) Empirical estimates to reduce modeling uncertainties of soil organic carbon in permafrost regions: a review of recent progress and remaining challenges. *Environmental Research Letters*. 8, 035020 doi:10.1088/1748-9326/8/3/035020
- Tang, J., Riley, W. J., Koven, C. D., and Subin, Z. M. (2013) CLM4-BeTR, a generic biogeochem-

ical transport and reaction module for CLM4: model development, evaluation, and application. *Geosci. Model Dev.*, 6, 127–140, doi:10.5194/gmd-6-127-2013

Koven, C. D., Riley, W. J., and Stern, A. T. (2012) Analysis of permafrost thermal dynamics and response to climate change in the CMIP5 Earth System Models. *J. Climate*, doi:10.1175/JCLI-D-12-00228.1

Subin, Z. M., C. Koven, W. Riley, M. Torn, D. Lawrence, S. Swenson, (2012) Effects of Soil Moisture on the Responses of Soil Temperatures to Climate Change in Cold Regions. *J. Climate*, doi:10.1175/JCLI-D-12-00305.1

Burke, E., Jones, C., Koven, C. (2012) Estimating the permafrost-carbon-climate response in the CMIP5 climate models using a simplified approach. *J. Climate*. doi:10.1175/JCLI-D-12-00550.1

Harden, JW, Koven, C, Ping C, Hugelius, G, McGuire, AD, Camill, P, Jorgenson, T, Kuhry, P, Michaelson, G, O'Donnell, JA, Schuur, EAG, Tarnocai, C, Johnson, K, Grosse, G, (2012) Field Information Links Permafrost Carbon to Physical Vulnerabilities of Thawing. *Geophys. Res. Lett.*, 39, L15704 doi:10.1029/2012GL051958

Ringeval B, Decharme B, Piao SL, Ciais P, Papa F, de Noblet-Ducoudré N, Prigent C, Friedlingstein P, Gouttevin I, Koven C, Ducharme A., (2012) Modelling sub-grid wetland in the ORCHIDEE global land surface model: evaluation against river discharges and remotely sensed data *Geosci. Model Dev.*, 5(4):941–962, doi:10.5194/gmd-5-941-2012

McGuire AD, Christensen TR, Hayes D, Heroult A, Euskirchen E, Kimball JS, Koven C, Lafleur P, Miller PA, Oechel W, Peylin P, Williams M, Yi Y (2012) An assessment of the carbon balance of Arctic tundra: comparisons among observations, process models, and atmospheric inversions *Bio-geosciences* 9 (8):3185–3204 doi:10.5194/bg-9-3185-2012

Luo, Y. Q., Randerson, J. T., Abramowitz, G., Bacour, C., Blyth, E., Carvalhais, N., Ciais, P., Dalmonech, D., Fisher, J. B., Fisher, R., Friedlingstein, P., Hibbard, K., Hoffman, F., Huntzinger, D., Jones, C. D., Koven, C., Lawrence, D., Li, D. J., Mahecha, M., Niu, S. L., Norby, R., Piao, S. L., Qi, X., Peylin, P., Prentice, I. C., Riley, W., Reichstein, M., Schwalm, C., Wang, Y. P., Xia, J. Y., Zehale, S., and Zhou, X. H. (2012) A framework for benchmarking land models, *Biogeosciences*, 9, 3857–3874, doi:10.5194/bg-9-3857-2012

Gouttevin I., Menegoz M., Dominé F., Krinner G., Koven C., Ciais P., Tarnocai C., Boike J. (2012) How the insulating properties of snow affect soil carbon distribution in the continental pan-Arctic area. *J. Geophys. Res.* 111, G02020 doi:10.1029/2011JG001916

Ciais P, Tagliabue A, Cuntz M, Bopp L, Scholze M, Hoffmann G, Lourantou A, Harrisson SH, Prentice IC, Kelley, DI, Koven C, Piao SL (2012) Large inert carbon pool in the terrestrial biosphere during the Last Glacial Maximum *Nature Geoscience* 5, 74–79 doi:10.1038/ngeo1324

Koven CD, Ringeval B, Friedlingstein P, Ciais P, Cadule P, Khvorostyanov D, Krinner G, Tarnocai C. (2011) Permafrost carbon-climate feedbacks accelerate global warming. *Proceedings of the National Academies of Science*, 108 (36), 14769–14774. doi:10.1073/pnas.1103910108

Ringeval B, Friedlingstein P, Koven C, Ciais P, de Noblet-Ducoudré N, Decharme B, Cadule P. (2011) Climate-methane feedback from wetlands and its interaction with the climate-carbon cycle feedback. *Biogeosciences* 8:2137–2157. doi:10.5194/bg-8-2137-2011

Wang, X., S. Piao, P. Ciais, J. Li, P. Friedlingstein, C. Koven, A. Chen (2011) Spring temperature change and its implication in the change of vegetation growth in North America from 1982 to 2006.

Wang T, Ciais P, Piao SL, Ottlé C, Brender P, Maignan F, Arain A, Cescatti A, Gianelle D, Gough C, Gu L, Lafleur P, Laurila T, Marcolla B, Margolis H, Montagnani L, Moors E, Saigusa N, Vesala T, Wohlfahrt G, Koven C, Black A, Dellwik E, Don A, Hollinger D, Knohl A, Monson R, Munger J, Suyker A, Varlagin A, Verma S (2011). Controls on winter ecosystem respiration in temperate and boreal ecosystems *Biogeosciences* 8:2009-2025. doi:10.5194/bg-8-2009-2011

Eglin T, Ciais P, Piao S, Barre P, Bellason V, Cadule P, Chenu C, Gasser T, Koven CD, Reichstein M, Smith P (2010), Historical and future perspectives of global soil carbon response to climate and land-use changes. *Tellus B*. 62 (5), 700-718. doi:10.1111/j.1600-0889.2010.00499.x

Koven, C. D., P. Friedlingstein, P. Ciais, D. Khvorostyanov, G. Krinner, and C. Tarnocai, (2009) On the formation of high-latitude soil carbon stocks: The effects of cryoturbation and insulation by organic matter in a land surface model. *Geophys. Res. Lett.*, (36), L21501, doi:10.1029/2009gl040150

Goldstein, A. H., C. D. Koven, C. L. Heald, and I. Y. Fung, (2009) Biogenic Carbon and Anthropogenic Pollutants Combine to Form a Cooling Haze Over the Southeastern US. *Proceedings of the National Academies of Science*, 106 (22), 8835-8840, doi:10.1073/pnas.0904128106

Koven, C. D., and I. Fung, (2008) Identifying global dust source areas using high-resolution land surface form. *J. Geophys. Res.*, 113, D22204, doi:10.1029/2008jd010195

Buermann, W., B. R. Lintner, C. D. Koven, A. Angert, J. E. Pinzon, C. J. Tucker, and I. Fung, (2007) The changing carbon cycle at Mauna Loa Observatory. *Proceedings of the National Academies of Science*, 104 (11), 4249-4254, doi:10.1073/pnas.0611224104

Koven, C. D., and I. Fung (2006), Inferring dust composition from wavelength-dependent absorption in Aerosol Robotic Network (AERONET) data, *J. Geophys. Res.*, 111, D14205, doi:10.1029/2005jd006678

Lintner, B. R., W. Buermann, C. D. Koven, and I. Y. Fung (2006), Seasonal circulation and Mauna Loa CO<sub>2</sub> variability, *J. Geophys. Res.*, 111, D13104, doi:10.1029/2005jd006535

Perron, J. T., M. P. Lamb, C. D. Koven, I. Y. Fung, E. Yager, and M. Ádámkovics (2006), Valley formation and methane precipitation rates on Titan. *J. Geophysical Research*, 111, E11001, doi:10.1029/2005je002602

#### MANUSCRIPTS IN REVIEW

Hugelius, G., Tarnocai, C., Bockheim, J. G., Camill, P., Elberling, B., Grosse, G., Harden, J. W., Johnson, K., Jorgenson, T., Koven, C. D., Kuhry, P., Michaelson, G., Mishra, U., Palmtag, J., Ping, C.-L., O'Donnell, J., Schirrmeyer, L., Schuur, E. A. G., Sheng, Y., Smith, L. C., Strauss, J., and Yu, Z.: (2013) Short communication: a new dataset for estimating organic carbon storage to 3 m depth in soils of the northern circumpolar permafrost region, *Earth Syst. Sci. Data Discuss.*, 6, 73-93, doi:10.5194/essdd-6-73-2013

#### SELECTED PRESENTATIONS

C.D. Koven, W.J. Riley. Analysis of permafrost thermal dynamics and response to climate change in the CMIP5 models. AGU Fall Meeting, San Francisco, Dec. 2012.

C.D. Koven, W.J. Riley, M.S. Torn, Z.M. Subin, J. Tang. Development, testing, and dynamics of a vertically-resolved C and N model in CLM4. AGU Fall Meeting, San Francisco, Dec. 2012.

C. Koven, W. Riley, A. Stern. Analysis of permafrost thermal dynamics and response to climate

change in the CMIP5 Earth System Models. Third International Conference on Earth System Modelling, Hamburg, Germany, Sep. 2012

C. Koven, J. W. Harden, W. J. Riley, C.-L Ping, G. Hugelius, A.D. McGuire, P. Camill, T. Jorgenson, P. Kuhr, G. Michaelson, J. A. O'Donnell, E. A.G. Schuur, C. Tarnocai, K. Johnson, G. Gross. Quantifying Permafrost C Vulnerable to Climate Change. Tenth International Conference on Permafrost, Salekhard, Russia, June, 2012

C. Koven. Frozen Soil Carbon and its Impact on Climate Change. AAAS Annual Meeting, Feb. 2012

C. Koven, W. J. Riley, Z. M. Subin, J. Tang, M. Torn, J. Harden, D. Lawrence, G. Bonan, S. Swenson. Permafrost C and N Dynamics in CLM4, AGU Fall Meeting, San Francisco, Dec. 2011

C. Koven, B. Ringeval, P. Ciais, P. Friedlingstein, D. Khvorostyanov, G. Krinner, C. Tarnocai. The response of frozen soil respiration to warming controls the 21st century high-latitude carbon balance. AGU Fall Meeting, San Francisco, Dec. 2010

C. Koven, B. Ringeval, P. Ciais, P. Friedlingstein, D. Khvorostyanov, G. Krinner. Impact of frozen soil carbon processes on high latitude carbon balance, IPY Science Conference, Oslo, June 2010

C. Koven, P. Friedlingstein, P. Ciais, D. Khvorostyanov, G. Krinner. Emissions of CO<sub>2</sub> and CH<sub>4</sub> from decomposition of permafrost soil organic carbon under future climate scenarios in ORCHIDEE. International CO<sub>2</sub> Conference 8 (ICDC8), Jena, Germany, 2009

C. Koven, P. Friedlingstein, P. Ciais, D. Khvorostyanov, G. Krinner, Modelling permafrost carbon in ORCHIDEE: accumulation and fate under global warming scenarios. Carbon pools in permafrost regions (CAPP) 2nd Workshop, Stockholm, 2009

C. Koven, P. Friedlingstein, P. Ciais, D. Khvorostyanov, Fate of Permafrost Carbon in ORCHIDEE. EGU Spring meeting, Vienna, 2009

C. Koven, A. H. Goldstein, C. L. Heald, and I. Y. Fung, Space Observations Reveal Biogenic Aerosols Dominate in Southeastern US. AGU Fall meeting, San Francisco, 2007

#### EXPERIENCE

Lawrence Berkeley National Lab, Berkeley, CA  
*Research Scientist*

June 2013-Present

Lawrence Berkeley National Lab, Berkeley, CA  
*Project Scientist*

Aug 2010-June 2013

Laboratoire des Sciences du Climat et de l'Environnement (LSCE), Gif-sur-Yvette, France  
*Postdoctoral Researcher CNRS / Chercheur CDD CNRS*

July 2008-July 2010

University of California, Berkeley, CA  
*Postdoctoral Researcher*

January 2007-June 2008

University of California, Berkeley, CA  
*Graduate Student Researcher*

September 2000-December 2006

University of California, Berkeley, CA  
*Teacher: Early Academic Outreach Program: Pre-College Academy*

July 2005

University of California, Berkeley, CA

*Graduate Student Instructor:* Biology 1B

September-December 2001

ORGANIZATIONS  
AND OUTREACH

Contributing Author, Intergovernmental Panel on Climate Change Fifth Assessment, Chapter 6 (Carbon and other biogeochemical cycles)	2011-Present
Member, NSF Permafrost Carbon Research Coordination Network	2011-Present
Member, NCAR Community Land Model Working Group	2010-Present
Editor, Berkeley Science Review	2005-2006